Calibration of the modulation transfer function of surface profilometers with binary pseudo-random test standards: expanding the application range

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An MTF calibration method based on binary pseudo-random (BPR) gratings and arrays [Opt. Eng. **47**(7), 073602-1-5 (2008)] has been proven to be an effective MTF calibration method for a number of interferometric microscopes and a scatterometer [Nucl. Instr. and Meth. A (2009), doi:10.1016/j.nima.2009.11.046]. Here we report on a further significant expansion of the application range of the method. We describe the MTF calibration of a 6 inch phase shifting Fizeau interferometer. Beyond providing a direct measurement of the interferometer's MTF, tests with a BPR array surface have revealed an asymmetry in the instrument's data processing algorithm that fundamentally limits its real bandwidth. Moreover, the tests have revealed the effect of the instrument's detrending and filtering procedures on power spectral density measurements. The details of the development of a BPR test sample suitable for calibration of a scanning electron microscope are also presented. The investigations confirm the universal character of the method that makes it applicable to a large variety of metrology instrumentation with spatial wavelength bandwidths from a fraction of a micrometer to hundreds of millimeters. Supported by the U.S. Department of Energy under Contract No. DE-AC02-05CH11231.

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